

Funding Strategies of G-SIBs

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Abstract

Purpose: The purpose of the article is to analyze the main features of the identified funding strategies of G-SIBs and changes in strategies under the influence of financial market conditions and new regulatory requirements.

Methods: The proposed method uses cluster analysis of the main indicators for banking funding (the share of deposits in liabilities, the share of derivatives in liabilities, the share of subordinated liabilities in total liabilities, as well as the share of short-term wholesale funding in liabilities) based on the agglomerative hierarchical clustering algorithm of Ward and the Hartigan Index as the criterion for evaluating the optimal number of clusters. The research covers G-SIBs, spanning the period 2007–2018.

Findings & Value added: The study has allowed to identify three main groups of banking strategies – deposit-based, mix and wholesale-based. Changes in the main features of these strategies have indicated the growth of the role of deposit funding, and a clear decrease in the value of derivatives in the structure of liabilities of G-SIBs. These two trends confirm the efficiency of the introduced regulatory measures to ensure higher financial soundness of banks and reduced funding risks. The study finds that the growth of deposit funding is not accompanied by an increase in the share of loans in assets. Regulatory authorities should introduce mechanisms that would have a major impact on changing strategies of asset management for global banks to increase the role of loans, which will have a positive impact on the development of the real economy.

Keywords: G-SIBs, bank, assets and liabilities management, wholesale-based funding, deposit-based funding.

JEL: G1, G21, G32, M19

Strategie finansowania globalnych systemowo ważnych banków

Streszczenie

Cel: celem artykułu jest analiza głównych cech zidentyfikowanych strategii finansowania G-SIBs oraz zmian w strategiach pod wpływem warunków rynku finansowego i nowych wymogów regulacyjnych.

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Metody: proponowana metoda wykorzystuje analizę skupień głównych wskaźników finansowania bankowego (udział depozytów w zobowiązaniach, udział instrumentów pochodnych w zobowiązaniach, udział zobowiązań podporządkowanych w pasywach ogółem, a także udział krótkoterminowego finansowania hurtowego w zobowiązaniach) i opiera się na hierarchicznym podejściu do analizy skupień aglomeracyjną metodą Warda oraz wskaźniku Hartigana jako kryterium oceny optymalnej liczby skupień. Badania obejmują dane G-SIBs w okresie 2007–2018.

Wyniki i wartość dodana: badanie pozwoliło zidentyfikować trzy główne grupy strategii banków: depozytową, mieszaną i hurtową. Zmiany w głównych cechach tych strategii wskazały na wzrost roli finansowania depozytowego oraz wyraźny spadek wartości instrumentów pochodnych w strukturze zobowiązań G-SIBs. Te dwie tendencje potwierdzają skuteczność wprowadzonych środków regulacyjnych w celu zapewnienia większej stabilności finansowej banków i zmniejszenia ryzyka finansowania. Z badania wynika, że wzrostowi finansowania depozytów nie towarzyszy wzrost udziału kredytów w aktywach. Dlatego z punktu widzenia organów regulacyjnych warto wprowadzić mechanizmy, które w znacznym stopniu wpłyną na zmianę strategii zarządzania aktywami dla globalnych banków w celu zwiększenia roli kredytów i pozytywnie wpłyną na rozwój gospodarki realnej.

Słowa kluczowe: G-SIBs, bank, zarządzanie aktywami i pasywami, finansowanie hurtowe, finansowanie depozytowe.

1. Introduction

In the process of economic evolution, banks, performing the primary functions of accepting deposits and lending funds, have become an important integral node of the coordinated functioning of the socio-economic system. This junction connects all sectors of the economy (households, real economy, financial system, state), and therefore its stable functioning is an important prerequisite for balanced social development.

Banking institutions, namely global systemically important banks (G-SIBs), are the main institutions of the financial system, including their activities in the financial instruments market, and they have ambivalent impact, contributing to the development and maintenance of market stability and causing market shocks that may be systemic in nature.

The interaction between banks and the financial market has a dualistic dimension – on the one hand, troubles in the banking sector provoke market shocks, on the other – market instability can cause banking dysfunctionality. These imbalances can be expanded based on the feedback loop.

The shift in emphasis in the policy of funding diversification through the active use of negotiable debt instruments was one of the features of the banking business models in international practice before the great recession. In addition, banks are the main participants in the short-term funding market based on the issue of commercial papers, in the REPO market, etc. Wholesale short-term funding is one of the aspects of increasing fragility in the banking system, which reveals in the elevated bank sensitivity to unpredictable significant market fluctuations, that is, the market can destabilize banking activities through this funding channel.

On the other hand, banks can also affect the market negatively. Thus, the realization of credit risk by banks' inability to meet their obligations on issued debt instruments can cause market shocks – increasing the market risk premium, which will reduce opportunities for market funding for potential recipients of financial resources. In addition, market liquidity will vanish, which will also increase the level of instability in this segment of the financial instruments market.

2. Literature Review

One of the first research studies concerning the impact of the financial crisis on banks' funding in the EU was a document of the European Central Bank (ECB) in May 2009. This assessment covered the sources and cost of funding, as well as the way in which banks managed their funding structures. The analysis also benefited from a survey of 36 mostly medium-sized and large EU banks. One immediate reaction on the part of banks that previously relied mainly on wholesale funding was to change their funding to more stable sources. The surveyed banks confirm that deposits have become the preferred source of funding, albeit in increasingly competitive market conditions. Given the long-term funding constraints, banks' focus has shifted to short-term funding. The banks surveyed are more concerned about day-to-day market developments and the impact on their funding structures. This has made banks extremely sensitive to market developments. The great recession has challenged and highlighted the following issues: (1) decreasing availability of funding as a result of the freezing of wholesale and interbank markets; (2) rising cost of bank funding, partly as a result of increased bank counterparty risk; (3) shortening of funding maturities challenges asset liability management (ALM) and profitability in the context of relatively flat or even inverted yield curves in the euro area. This results from contingency funding plans that did not fully cover the risks of maturity mismatches on and off the balance sheet; (4) currency mismatches in funding have occurred as funding sources in foreign currencies have become severely restricted (ECB, 2009, pp. 4, 7).

In 2012, the ECB, using statistics for monetary financial institutions domiciled in the euro area from 1999 to the end of 2011 on an unconsolidated basis, analyzed changes in five broad categories of bank funding: interbank, customer deposits, debt securities, central bank funding and capital. The main conclusions were: interbank liabilities as a proportion of banks' total assets fell substantially from the third quarter of 2008; the overall share of deposit liabilities in total assets started to increase, after declining gradually in the years to 2008. At the same time, loan-to-deposit ratios decreased from their peak in the third quarter of 2008. A broad shift towards deposits at longer maturities can be observed at the aggregate level and across

countries, marking a clear change in pattern with respect to the pre-crisis period; the decline in the ratio of debt securities to assets started in 2007, i.e. before the outbreak of the financial crisis. In 2011, gross issuance of debt securities by euro area banks roughly halved from its peak observed in 2006, with securitization also falling sharply after 2008 (ECB, 2012, p. 4).

Demirgüç-Kunt and Huizinga (2010) have examined the implications of bank activity and short-term funding strategies for bank risk and return using an international sample of 1,334 banks in 101 countries. The evidence presented in this paper suggests that traditional banks, with a heavy reliance on interest income generation and deposit funding, are safer than banks that go very far in the direction of noninterest income generation and funding through the wholesale capital market. Their results provide a strong indication that banking strategies that rely preponderantly on noninterest income or non-deposit funding are very risky.

Huang and Ratnovski (2011) have modeled a “dark side” of wholesale funding. In an environment with a costless but noisy public signal on bank project quality, short-term wholesale financiers have lower incentives to conduct costly monitoring, and instead may withdraw based on negative public signals, triggering inefficient liquidations.

Agur (2013) have analyzed how different types of bank funding affect the extent to which banks ration credit to borrowers, and the impact that capital requirements have on that rationing. Unsecured wholesale finance is shown to amplify the credit market impact of capital requirements as compared to funding by retail depositors.

Amidu (2013), using a panel dataset of 978 banks during 2000–2007 and employing systems generalized methods of moment estimator (systemGMM), has explored how funding strategies of banks with market power affect their return on assets and insolvency risk. Relating the bank funding structure to insolvency risk, the results have suggested that banks that rely heavily on internal and deposit funding are safer than those that finance their assets with wholesale funds. The results thus provide support to the existing findings that banking strategies that depend predominantly on attracting non-deposit funding are more risky and less resilient to the crisis.

The paper of Van Rixtel and Gasperini (2013) provides an overview of bank funding trends in the euro area following the 2007–2009 global financial crisis and the euro area crisis. It shows that funding has become segmented along national borders and that secured instruments are much more prevalent than previously. Rising debt retention by euro area banks has accompanied greater dependence on liquidity provided by the ECB.

Truno, Stolyarov, Auger and Assaf (2017) have concluded that after the financial crisis Canadian banks increased their reliance on retail and commercial deposits, increased the average maturity of their wholesale borrowings and further diversified their funding sources in foreign markets. The variety of funding tools and the changes in their use over time indicate

that the Big Six Canadian banks are sophisticated financial institutions that value the diversity of funding sources, optimize their funding mixes and continuously adapt to a changing external environment.

Jin, Kanagaretnam and Liu (2018), using a sample of U.S. public and private banks, have examined the implications of banks' funding strategies for banks' earnings quality. They have found that the ratio of core deposits to total liabilities, their proxy for bank reliance on retail deposits over wholesale funds, is negatively and significantly associated with the magnitude of earnings management through discretionary loan loss provisions. This finding is consistent with the arguments that retail deposits are relatively more stable and information-insensitive, reflecting a more conservative business model.

One of the recent research studies in this field was a book by Crespi and Mascia "Bank Funding Strategies. The Use of Bonds and the Bail-in Effect". In this monograph, they have aimed to illustrate the general evolution of European banks' funding strategies during the last 10 years and to give a special focus on the importance of bonds as a funding choice for the Italian banking sector.

Considering the results of the great recession at the international level, a significant number of recommendations have been developed that are used in national financial systems to ensure the financial soundness of banking institutions. Particular attention is focused on global systemically important banks, whose deteriorating financial soundness may have a global negative impact on the international financial system.

The new regulatory requirements also apply to banks' operations regarding their funding strategies, which should be less risky in nature and be integrated with the banking asset management strategies, ensuring a sufficient level of liquidity and solvency of banks.

On 9 November 2015, the Financial Stability Board (FSB) published *Principles on Loss-absorbing and Recapitalisation Capacity of G-SIBs in Resolution. Total Loss-absorbing Capacity (TLAC) Term Sheet*. The objective of this standard is to ensure that G-SIBs have the loss-absorbing and recapitalisation capacity necessary to help ensure that, in and immediately following a resolution, critical functions can be continued without taxpayers' funds (public funds) or financial stability being put at risk (FSB, 2015). TLAC requirements can be met by instruments that are eligible for the minimum regulatory capital requirement, plus debt liabilities that meet certain criteria. One of those criteria is that TLAC-eligible liabilities should be subordinated to TLAC-excluded liabilities, such as deposits and structured products (BIS, 2015).

In 2017, FSB published a consultative document that provides additional guidance on the development of an implementable resolution funding plan to support the ongoing work of authorities to operationalize resolution strategies and plans. It builds on existing supervisory and resolution guidance

on liquidity risk management and resolution planning, respectively, and identifies a set of key funding strategy elements (FSB, 2017).

On 2 July 2019, FSB published a review of the TLAC Standard. The review concludes that progress in implementation has been steady and significant. This has been instrumental in enhancing the resolvability of G-SIBs, strengthening cooperation between home and host authorities and boosting market confidence in authorities' capabilities to address "too-big-to-fail" (TBTF) risks (FSB, 2019b).

The aim of this article is to analyze the main features of the identified funding strategies of G-SIBs and changes in strategies under the influence of financial market conditions and new regulatory requirements.

The research is based on verification of the following hypotheses:

1. Funding strategies of G-SIBs are changing in the direction of deposit funding growth, and this tendency is typical for all banks, regardless of their national origin and specialization.
2. The change in liability management strategies to classic banking is mainly not accompanied by an increase in the role of lending in the asset management strategies of global banks.
3. The change in funding strategies is characterized by a diminishing role of balance sheet derivatives in liabilities management of G-SIBs.

3. Research Methodology

In order to identify different groups of G-SIBs as regards funding their business, the main indicators for this type of banking activities are chosen, namely:

- Customer deposits / Total funding excluding derivatives (CD/TF);
- Derivative financial instruments/Total liabilities (D/TL);
- Subordinated liabilities/Total liabilities (SL/TL);
- Short-term wholesale funding/Total liabilities (STW/TL).

The following is a cluster analysis of the data set of these indicators for G-SIBs in different time periods (2007, 2010, 2014, 2018) in order to determine the modification of banking funding strategies under the influence of various economic and regulatory factors.

The groups were identified using the agglomerative hierarchical clustering method of Ward. This method is agglomerative, thus it partitions elements into a dedicated number of clusters in several steps. First each element is independent, and then step by step more elements will be ordered to a cluster. At each step, the method includes those elements which are the "closest" (according to a metric) to the existing clusters. The number of steps may reach from 1 to n (number of analyzed elements). In the case of 1, only one single cluster contains all elements, while in the case of n, all elements form their own cluster. Once a cluster is created as a result

of a step, the elements of the new cluster cannot be separated again. The algorithm tries to find the optimal number of clustering steps (Eszergár-Kiss & Caesar, 2017, p. 26).

In this research, the Hartigan Index was used as the criterion for evaluating the optimal number of clusters. Calculations were carried out in the R using package NbClust (Charrad, Ghazzali, Boiteau, & Niknafs, 2014).

In order to analyze the role of funding strategies in the activities of G-SIBs, the following additional indicators of banks were also used:

- Repurchase agreements, securities loaned, cash collateral/Total liabilities (REPO/L);
- Customer loans and advances/Total assets (L/A);
- Return on average equity (ROAE);
- Interest expense on customer deposits/Average customer deposits (IECD/CD).

The analysis was performed for banks identified as G-SIBs in November 2019 (FSB, 2019a). Financial data of banks are obtained from the BankFocus databases.

4. Results

The bank data for 2007 make it possible to identify funding strategies for G-SIBs that were formed in the regulatory and economic conditions before the great recession. Using 4 indicators of banking activity in this area, based on cluster analysis, 3 groups of banks were distinguished (during this period, only data from 22 G-SIBs were available for calculating indicators), and descriptive statistics for individual groups allowed us to determine their specific features in the context of:

- dominance of a certain source of funding;
- the level of development of classic banking activities, i.e. lending;
- regional features;
- the level of income and expenses of banks.

For the first group (8 banks), the funding strategy can be described as deposit-based, since bank deposits dominate as a source of funding (the average value is more than 80%), with a minor role of derivatives, subordinated liabilities and short-term wholesale funding in the structure of liabilities. The application of this strategy has a certain regional and specialized dimension. It is typical for global banks from China and Japan. Some U.S. banks have also used this strategy.

Group of banks	CD/TF	D/TL	SL/TL	STW/TL
Group 1				
Bank of China	83.03	0.49	1.08	11.98
Industrial and Commercial Bank of China	86.79	0.09	0.43	12.28
Mitsubishi UFJ FG	76.78	4.13	3.02	13.45
Wells Fargo	75.05	0.26	3.48	6.48
Agricultural Bank of China	90.33	0.12	0.00	9.14
Bank of New York Mellon	80.95	2.46	5.01	6.93
China Construction Bank	88.30	0.30	0.65	10.64
State Street	79.79	3.33	1.74	15.67
Mean	82.63	1.39	1.93	10.82
<i>Minimum</i>	<i>75.05</i>	<i>0.09</i>	<i>0.00</i>	<i>6.48</i>
<i>Maximum</i>	<i>90.33</i>	<i>4.13</i>	<i>5.01</i>	<i>15.67</i>
Group 2				
Barclays	31.80	20.78	1.52	31.74
BNP Paribas	28.19	15.03	1.14	17.02
Deutsche Bank	38.79	27.18	0.77	12.82
Credit Suisse	32.60	6.09	1.42	31.57
Société Générale	36.68	15.53	1.10	12.96
Mean	33.61	16.92	1.19	21.22
<i>Minimum</i>	<i>28.19</i>	<i>6.09</i>	<i>0.77</i>	<i>12.82</i>
<i>Maximum</i>	<i>38.79</i>	<i>27.18</i>	<i>1.52</i>	<i>31.74</i>
Group 3				
JP Morgan Chase	58.09	4.82	3.71	18.68
Citigroup	46.35	5.01	2.59	24.61
HSBC	57.15	8.27	1.12	6.58
Bank of America	54.03	1.47	3.39	28.51
Groupe Crédit Agricole	47.77	12.57	1.53	10.33
ING Bank	56.60	2.79	1.73	16.68
Santander	47.81	6.20	4.23	13.20
Standard Chartered	67.67	8.52	5.1	8.39
UniCredit	46.17	7.37	3.22	16.98
Mean	53.52	6.34	2.96	15.99
<i>Minimum</i>	<i>46.17</i>	<i>1.47</i>	<i>1.12</i>	<i>6.58</i>
<i>Maximum</i>	<i>67.67</i>	<i>12.57</i>	<i>5.10</i>	<i>28.51</i>

Tab. 1. Key indicators of banking clusters in 2007. Source: Prepared by author.

A more complete description of banks' funding strategies can be based on the analysis of additional indicators of banks' activities concerning funding operations in the REPO market, credit activity, and the impact of the strategy on banks' income and expenses (Table 2).

Group of banks	REPO/L	L/A	ROE	IECD/CD
1	2.39	42.92	9.93	1.94
2	10.15	22.68	15.09	3.59
3	6.57	45.32	13.59	3.17

Tab. 2. Average values of additional indicators of banking clusters in 2007. Source: Prepared by author.

For banks with a deposit-based strategy, REPO operations, securities loaned and cash collateral have a minor role in funding and there is the lowest return on equity compared to other groups, but also the lowest cost of deposits. Group 1 banks are also characterized by the fact that only half of their assets were in the form of loans. However, not all banks in this cluster have homogeneous additional indicators, in particular, it applies to U.S. banks as concerns their assets. Thus, Wells Fargo's asset structure was dominated by loans (66%), while other banks had a fairly low share of loans (Bank of New York Mellon – 26%, State Street – 11%).

Group 2 banks' strategies can be defined as wholesale-based, because the average value of the CD/TF ratio for these banks is the lowest (33,6%), there is significantly higher inclusion of derivatives in funding compared to the other groups (16,9%) and there is a high value of short-term wholesale funding (21,2%). The financial resources were mainly invested in non-credit assets (L/A only 23%). Such methods of banks' assets and liabilities management have generated the highest return on equity compared to the other clusters, but also a high level of costs for accumulating deposits. An interesting feature of this group of banks is their regional dimension – they are only banks from Europe, although it is often argued that U.S. banks were the most engaged in wholesale funding, which has had a negative impact on both the banks and the U.S. financial system as a whole during the great recession.

Group 3 of banks can be identified as institutions with a mixed funding strategy, which provided accumulation of about half of the resources from deposit sources. The L/A value for banks in this group was similar to banks with a deposit-based strategy, but the value of ROE was higher for mix funding strategies. In the regional dimension, this group included the largest U.S. banks, as well as banking institutions from Europe.

The global financial crisis has played a significant role in changing the strategies of global banks. These changes can be clearly seen based on the results of the cluster analysis of G-SIBs financial data for 2010 (there were already more banks in the sample for this period – 25 banks).

Group of banks	CD/TF	D/L	SL/L	STW/L
Group 1				
Bank of China	81.65	0.37	0.93	16.21
Industrial and Commercial Bank of China	90.07	0.08	0.62	9.07
Mitsubishi UFJ FG	77.79	5.08	3.10	13.18
Wells Fargo	76.27	0.63	4.51	7.02
Agricultural Bank of China	92.53	0.13	0.51	6.33
Bank of New York Mellon	82.45	2.42	2.26	6.59
China Construction Bank	91.30	0.09	0.79	7.48
Standard Chartered	75.39	9.87	3.34	5.98
State Street	75.65	3.98	1.78	15.96
Mean	82.57	2.52	1.98	9.76
<i>Maximum</i>	<i>92.53</i>	<i>9.87</i>	<i>4.51</i>	<i>16.21</i>
<i>Minimum</i>	<i>75.39</i>	<i>0.08</i>	<i>0.51</i>	<i>5.98</i>
Group 2				
Barclays	34.37	28.41	2.00	28.50
Goldman Sachs	6.93	6.52	2.72	28.29
Credit Suisse	35.00	5.98	2.35	28.73
Morgan Stanley	12.11	6.37	1.19	28.37
Mean	22.10	11.82	2.06	28.47
<i>Maximum</i>	<i>35.00</i>	<i>28.41</i>	<i>2.72</i>	<i>28.73</i>
<i>Minimum</i>	<i>6.93</i>	<i>5.98</i>	<i>1.19</i>	<i>28.29</i>
Group 3				
JP Morgan Chase	54.66	3.57	2.64	22.33
Citigroup	54.03	3.42	2.54	19.50
HSBC	63.78	11.25	1.45	5.64
Bank of America	55.09	2.75	3.48	19.25
BNP Paribas	42.59	18.52	1.29	15.72
Deutsche Bank	52.81	34.88	1.33	5.18
Groupe BPCE	48.26	8.90	1.39	10.59
Groupe Crédit Agricole	57.70	15.76	2.00	7.51
ING Bank	61.48	4.96	2.13	12.83
Santander	62.13	7.28	2.68	12.94
Société Générale	45.93	18.99	1.11	7.41

Table cont.

Group of banks	CD/TF	D/L	SL/L	STW/L
UniCredit	49.45	10.58	2.78	17.66
Mean	53.99	11.74	2.07	13.05
<i>Maximum</i>	63.78	34.88	3.48	22.33
<i>Minimum</i>	42.59	2.75	1.11	5.18

Tab. 3. Key indicators of banking clusters in 2010. Source: Prepared by author.

In another G-SIB, a deposit-based strategy was identified (Standard Chartered from Great Britain). The average values of ratio used for cluster analysis for the first group of banks did not change significantly compared to 2007. As for additional indicators, the ROE increased significantly (from 9.9% to 14.5%, three of the four banks from China had ROE exceeding 20%) and interest expenses in relation to deposits decreased.

Group of banks	REPO/L	L/A	ROE	IECD/CD
1	1.59	41.36	14.50	0.82
2	20.79	14.66	10.36	0.50
3	5.68	41.81	7.29	1.24

Tab. 4. Average values of additional indicators of banking clusters in 2010. Source: Prepared by author.

Significant changes have occurred in the composition of supporters of the dominance of wholesale funding. The three major European banks (Deutsche Bank, BNP Paribas, Société Générale) have increased the share of deposit funding and have moved to group 3 “mix-funding”. The wholesale funding cluster has included the former largest investment banks in the United States – Goldman Sachs and Morgan Stanley (which were not the objects of cluster analysis in 2007), in which deposit liabilities were of very small importance in 2010. For banks in this group, in comparison with 2007, the role of derivatives in funding is characterized by a decrease. Regarding additional indicators of this analysis, the role of REPO operations, securities loaned and cash collateral in funding has increased, the return on equity and the cost of deposit obligations has reduced.

The mix-funding group of banks is typical for a larger number of banks among G-SIBs. The share of short-term wholesale funding has decreased slightly, but the average share of derivatives in this group’s liabilities has increased, primarily due to the inclusion of Deutsche Bank in this cluster (D/L almost 35%). The ROE for banks with mixed funding has been the lowest compared to the other clusters (one bank has had a negative ROE – Bank of America – “minus” 0.66%).

According to the results of 2014 (the sample already has included all 30 G-SIBs), due to the negative impact of the European debt crisis and the strengthening of regulatory requirements to improve the financial soundness of banking institutions, we could observe an even greater inter-cluster migration towards the growth of the role of traditional deposit funding, but in terms of asset and liability management strategies, there was no growth in the role of loans in the asset structure of banks of different groups.

Group of banks	CD/TF	D/L	SL/L	STW/L
Group 1				
JP Morgan Chase	66.09	3.04	1.32	14.74
Citigroup	63.42	3.88	1.44	16.11
HSBC	68.80	14.00	2.05	9.17
Bank of America	67.07	2.47	2.23	14.16
Bank of China	80.72	0.29	0.91	16.81
Industrial and Commercial Bank of China	84.03	0.13	1.03	11.00
Mitsubishi UFJ FG	72.85	6.37	1.62	16.58
Wells Fargo	83.08	0.68	2.11	4.85
Agricultural Bank of China	86.63	0.05	0.84	8.58
Bank of New York Mellon	85.33	1.11	0.00	8.11
China Construction Bank	85.51	0.08	0.94	9.56
ING Bank	67.11	5.79	1.94	8.95
Mizuho FG	71.73	0.50	1.04	15.28
Santander	62.59	7.34	1.46	14.75
Standard Chartered	69.06	9.32	3.38	8.78
State Street	89.94	2.40	1.31	4.63
Sumitomo Mitsui FG	74.74	4.01	0.12	1.16
Toronto Dominion	62.64	5.66	0.86	17.48
Mean	74.52	3.73	1.37	11.15
Maximum	89.94	14.00	3.38	17.48
Minimum	62.59	0.05	0.00	1.16
Group 2				
Goldman Sachs	17.35	8.15	2.50	18.03

Table cont.

Group of banks	CD/TF	D/L	SL/L	STW/L
Morgan Stanley	28.84	5.50	1.81	16.70
Mean	23.10	6.83	2.16	17.37
<i>Maximum</i>	28.84	8.15	2.50	18.03
<i>Minimum</i>	17.35	5.50	1.81	16.70
Group 3				
Barclays	52.09	34.00	1.64	17.71
BNP Paribas	50.60	22.08	0.70	9.46
Deutsche Bank	64.72	37.62	0.96	3.43
Credit Suisse	49.24	4.26	2.87	22.27
Groupe BPCE	49.42	7.64	1.34	7.38
Groupe Crédit Agricole	57.80	13.75	1.53	6.16
Royal Bank of Canada	59.65	10.04	0.89	13.40
Société Générale	42.23	18.92	0.71	7.68
UBS	60.46	25.21	1.60	10.16
UniCredit	52.89	9.74	2.33	19.65
Mean	53.91	18.33	1.46	11.73
<i>Maximum</i>	64.72	37.62	2.87	22.27
<i>Minimum</i>	42.23	4.26	0.70	3.43

Tab. 5. Key indicators of banking clusters in 2014. Source: Prepared by author.

The group of banks with a dominant deposit-based funding strategy includes 18 G-SIBs with an average CD/TF value of almost 75%. However, the average share of loans in the assets of these banks is only about 42%. Those strategies have provided the highest level of ROE (10.4%) in comparison with the other clusters in 2014. This group of banks is characterized by a relatively insignificant role of derivatives in liabilities. From a regional perspective, this cluster includes all Chinese banks (with a high share of deposits in liabilities – more than 80%) and Japanese global banks, the largest American banks, 2 British banks, and only 2 banks from the European Union.

Group of banks	REPO/L	L/A	ROE	IECD/CD
1	5.49	41.77	10.37	0.83
2	12.59	10.57	7.81	0.24
3	5.30	36.81	5.69	0.89

Tab. 6. Average values of additional indicators of banking clusters in 2014. Source: Prepared by author.

The second identified cluster includes only 2 former U.S. investment banks, for which the wholesale market remains the key source of funding, although the share of deposits in these banks grew compared to 2010 (Goldman Sachs – from 6.9% to 17.4%, Morgan Stanley – from 12.1% to 18.8%). In addition, we can note a decrease in the share of short-term wholesale funding from 28.5% in 2010 to 17.4% in 2014. The share of REPO operations, securities loaned, cash collateral in bank funding (12.6%) remains the largest in comparison with the other clusters.

The third group of banks, which can be attributed to the use of a mix strategy, is characterized by an increasing role of deposits (53,9%) as a source of funding and these strategies become more difficult to separate from banks with a deposit-based strategy. However, these banks have a significantly higher role of derivatives in liabilities compared to the first cluster (18.3%). At Deutsche Bank and Barclays, the value of the D/L ratios is the highest (more than 30%). In the regional dimension, this cluster includes European banks and one bank from Canada. In terms of the use of financial resources, loans in this cluster have a smaller share of assets (36.8%) than for the first group. Strategies of banking institution from the third cluster are the least profitable in comparison with banks of the other clusters. Banks in all clusters have a low share of subordinated liabilities in total liabilities.

At the end of 2018, the difference between the clusters of banks with a deposit-based strategy and a mix strategy became even smaller due to an increase in the share of deposits in liabilities.

Group of banks	CD/TF	D/L	SL/L	STW/L
Group 1				
Bank of China	79.28	0.51	0.51	17.58
Industrial and Commercial Bank of China	86.38	0.29	1.11	10.54
Wells Fargo	79.40	0.48	1.95	8.28
Agricultural Bank of China	84.75	0.17	0.60	10.50
Bank of New York Mellon	80.25	0.71	0.39	10.15
China Construction Bank	83.03	0.23	0.69	11.60
Mizuho FG	80.07	3.61	1.84	10.39
State Street	92.20	2.22	0.87	0.63
Sumitomo Mitsui FG	77.27	1.66	1.02	9.05
Mean	82.51	1.10	1.00	9.86
Maximum	92.20	3.61	1.95	17.58
Minimum	77.27	0.17	0.39	0.63

Table cont.

Group of banks	CD/TF	D/L	SL/L	STW/L
Group 2				
Goldman Sachs	26.39	5.06	2.04	16.42
Morgan Stanley	35.40	3.49	1.31	12.42
Mean	30.90	4.28	1.67	14.42
<i>Maximum</i>	35.40	5.06	2.04	16.42
<i>Minimum</i>	26.39	3.49	1.31	12.42
Group 3				
JP Morgan Chase	69.12	1.76	0.70	12.44
Citigroup	65.46	2.94	1.52	14.46
HSBC	69.13	8.71	1.57	11.32
Bank of America	71.11	1.73	1.12	14.43
Barclays	57.21	20.54	1.92	19.18
BNP Paribas	57.72	12.40	0.91	7.77
Deutsche Bank	65.96	23.71	0.77	1.75
Mitsubishi UFJ FG	74.73	4.44	0.17	13.57
Credit Suisse	55.47	2.10	2.23	18.86
Groupe BPCE	53.10	5.03	1.47	7.14
Groupe Cr�dit Agricole	63.55	6.60	1.31	5.57
ING Bank	69.87	2.85	1.64	11.09
Royal Bank of Canada	56.53	7.19	0.73	23.31
Santander	63.43	4.59	1.76	18.63
Soci�t� G�n�rale	47.20	11.11	1.07	8.08
Standard Chartered	70.43	7.39	2.35	5.65
Toronto Dominion	63.50	3.85	0.70	18.78
UBS	57.61	13.89	0.00	5.54
UniCredit	59.36	4.74	1.29	23.60
Mean	62.66	7.66	1.22	12.69
<i>Maximum</i>	74.73	23.71	2.35	23.60
<i>Minimum</i>	47.20	1.73	0.00	1.75

Tab. 7. Key indicators of banking clusters in 2018. Source: Prepared by author.

For the first group, the average value of the CD/TF ratio was 82.5%, and the minimum value was 77.27%, which allowed us to identify a group of banks with a significant dominance of the deposit-based strategy. As before, these were all Chinese banks, 3 banks from the U.S. and most Japanese banks and one bank from Europe. This cluster is characterized by relatively low values concerning the role of derivatives and short-term wholesale funding in liabilities. There is also a constant trend in the asset funding strategy, according to which the average value of the share of loans in assets is less than 50% (only for banks from China, this ratio is slightly higher than 50%). In other words, there is a return to classic banking on the part of liabilities, but on the part of assets, classic lending for banks does not have a dominant value.

Group of banks	REPO/L	L/A	ROE	IECD/CD
1	2.99	41.81	9.79	0.83
2	9.37	14.12	11.58	1.24
3	6.58	42.21	7.89	0.79

Tab. 8. Average values of additional indicators of banking clusters in 2018. Source: Prepared by author.

The second group (with a predominance of wholesale funding) is further represented by U.S. banks – Goldman Sachs and Morgan Stanley, and the trend continues regarding the growing share of deposits in liabilities, and therefore in a few years it will be possible to assert the approval of a mix strategy in these institutions. In 2018, the average value of the CD/TF ratio was almost 31% (in 2014 – 23.1%). Banks of this cluster remain the leaders (compared to other G-SIBs groups) as regards the role of REPO operations, securities loaned, cash collateral and short-term wholesale funding. In 2018, these banks had an average ROE (11.6%) compared to the other groups.

The third group (19 banks) is the most numerous and is also characterized by a further increase in the role of deposits in financing (CD/TF less than 50% is only in Société Générale). In addition, we can note a decrease in the share of derivatives in liabilities, primarily due to a decrease of this ratio in Deutsche Bank (down to 24%) and Barclays (down to 21%). As for the first cluster, loans in assets are not dominant for this group of banks (only in 4 banks from the EU, this ratio is higher than 50%).

5. Conclusion

The conducted cluster analysis of global banks in the area of their financing (based on the share of deposits in liabilities, the share of derivatives in liabilities, the share of subordinated liabilities in total liabilities, as well

as the share of short-term wholesale funding in liabilities) has allowed for identifying three main groups of banking strategies – deposit-based, mix and wholesale-based.

For the period 2007–2018, the identified changes in the main features of these strategies have indicated the growth of the role of deposit funding, and this trend is typical for all global banks. In 2018, only for two former investment banks from the U.S. can a wholesale-based strategy be still clearly identified, although the share of deposit funding in these institutions increased significantly in recent years. In addition, there is a clear decrease in the value of derivatives in the structure of liabilities of G-SIBs. These two trends confirm the efficiency of the introduced regulatory measures to ensure the higher financial soundness of banks and reduce funding risks. However, of course, banks must ensure compliance with the principle of diversification of funding sources, in particular by using financial instruments of wholesale markets, including to meet the requirements of TLAC. The analysis has also shown that the change in funding strategies did not lead to significant changes in the aspect of profitability of the banking business (the largest drop in ROE (in 2018 in comparison with 2007) noted for banks with dominating wholesale funding).

The study confirmed the hypothesis that the growth of deposit funding is not accompanied by an increase in the share of loans in assets. Therefore, it is likely that regulatory authorities should introduce mechanisms that would have a major impact on changing strategies of asset management for global banks to increase the role of loans, the provision of which is a classic and should be a leading feature of banking activities, which will have a positive impact on the development of the real economy to provide financing for their business projects.

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